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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/816,150	04/01/2004	Ibrahim M. Elfadel	YOR920040001US1	9016

29683 7590 02/22/2007
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EXAMINER	
PATEL, SHAMBHAVI K	
ART UNIT	**PAPER NUMBER**
2128	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/22/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/816,150	ELFADEL, IBRAHIM M.	
	Examiner	Art Unit	
	Shambhavi Patel	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 November 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is in reply to the Arguments/Remarks submitted 30 November 2006.

2. Claims 1-20 are pending.

Response to Arguments

3. Applicant's arguments filed 30 November 2006 have been fully considered but they are not persuasive.

Regarding the 35 U.S.C. 101 rejection of claims 1 and 17:

i. The claims are directed to automatically selecting a macromodel from the set of macromodels to simulate one or more of the electrical transmission lines. This claimed subject matter lacks a practical application of a judicial exception (law of nature, abstract idea, naturally occurring article/phenomenon) since it fails to produce a useful, concrete and tangible result. Specifically, the claimed subject matter does not produce a tangible result because the claimed subject matter fails to produce a result that is limited to having real world value rather than a result that may be interpreted to be abstract in nature as, for example, a thought, a computation, or manipulated data. This produced result, a selected macromodel, remains in the abstract and, thus, fails to achieve the required status of having real world value

Regarding the 35 U.S.C. 103(a) rejection:

ii. Applicant submits, on page 7, that there is nothing in the prior art that teaches how to automate the generation of a transmission line macromodel. However, on page 8, Applicant admits that the prior art of record (Roychowdhury) automates the generation of the macromodel. Based on the previous Office Action and the Applicant's own

admission, the Examiner maintains that Roychowdhury discloses the automated generation of a macromodel.

iii. Applicant submits, on page 8, that Roychowdhury does not disclose the automated selection of a transmission line macromodel from amongst a competing number of already existing macromodels. Roychowdhury teaches different algorithms used to model linear and nonlinear systems **(abstract)**, and thus choosing which algorithm to use will ultimately select one specific macromodel from another macromodel that would have been produced has another algorithm been chosen. Applicant is further directed to **Section V.B ("Coupled Line")** of the **Elfadel** reference, which discloses two different macromodels generated using two different techniques, and compares the performances of the two macromodels to determine which is better suited from the problem (i.e. selecting a macromodel).

iv. Applicant submits, on page 8, that neither Elfadel nor Roychowdhury teaches how to use the total distortion of a multiconductor transmission line (computed **solely** based on physical characteristics) in a criterion fro the macromodel selection of transmission lines. The Examiner notes that the claims do not require that the distortion be computed **solely** based on physical characteristics. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

v. Applicant submits, on page 8, that neither Elfadel nor Roychowdhury disclose a database from which a macromodel is selected. The Examiner notes that a database is an organized collection of information records that can be accessed electronically. Applicant is again directed to **section V.B ("Coupled Line")** which discloses two different macromodels that are stored and accessed electronically.

vi. Applicant submits, on page 8, that Applicant's background of the invention does not disclose an error threshold and does not disclose automatically selecting a macromodel based on whether the total distortion is more or less than the error threshold. The Examiner notes that the Background of the specification is not relied upon for this limitation. As per the previous Office Action, the Examiner maintains that Roychowdhury discloses distortion **(Roychowdhury: page 15 right hand column)** and that a skilled artisan would have knowingly used an error threshold (i.e. input the acceptable values into the system).

vii. Applicant submits, on page 9, that neither Elfadel nor Roychowdhury disclose a critical length. The previously cited portion of the Elfadel reference discloses incorporating the length of the line into the analysis. Elfadel further discloses minimizing the length of the line (i.e. reaching a critical length) to improve the accuracy of the approximation **(section III 2nd paragraph).**

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. **Claims 1-12 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.** The Examiner asserts that the current state of the claim language is such that a reasonable interpretation of the claims would not result in any useful, concrete or tangible product. Selecting a macromodel in order to simulate a transmission line does not result in a tangible output. The claims are directed to automatically selecting a macromodel from the set of macromodels to simulate one or more of the electrical transmission lines. This claimed subject matter lacks a practical application of a

judicial exception (law of nature, abstract idea, naturally occurring article/phenomenon) since it fails to produce a useful, concrete and tangible result. Specifically, the claimed subject matter does not produce a tangible result because the claimed subject matter fails to produce a result that is limited to having real world value rather than a result that may be interpreted to be abstract in nature as, for example, a thought, a computation, or manipulated data. This produced result, a selected macromodel, remains in the abstract and, thus, fails to achieve the required status of having real world value. All other claims are rejected by virtue of their dependency.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claim(s) 1-13, 15-17, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Elfadel ('A Comparative Study of Two Transient Analysis Algorithms for Lossy Transmission Lines With Frequency-Dependent Data', May 2002) in view of Roychowdhury ('Automated Macromodel Generation for Electronic Systems', August 2003).

Regarding claim 1:

Elfadel discloses a computer modeling system comprising:

a. a processor that has at least one input that receives parameters related to one or more electrical transmission lines **(page 144)**, the parameters representing one or more physical characteristics **(page 144 equation 3)** and one or more electrical characteristics **(page 1144 equation 2)** of the one or more electrical transmission lines. The input parameters include the parallel admittance and the series impedance of the transmission line *(analogous to electrical characteristics)* and the length of the transmission line *(analogous to physical characteristics).*

b. a database with a set of one or more macromodels that in which the processor is arranged to apply the parameters in a simulation to determine an electrical behavior of one or more of the electrical transmission lines **(Introduction; page 149).** Based on the input parameters, a macromodel is automatically developed, and this can subsequently be integrated into a circuit simulator.

Elfadel fails to explicitly disclose automating the above process and then automatically selecting a macromodel. Roychowdhury teaches an automated macromodel generation system for electronic systems **(Roychowdhury: abstract).** At the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the teachings of Elfadel and Roychowdhury because automating the

macromodelling process is essential for realistic exploration of the design space in current and future mixed signal SoCs/SiPs **(Roychowdhury: Introduction).**

Regarding claim 2:

Elfadel discloses the system as set forth in claim 1, further comprising one or more outputs of the electrical behavior of one or more of the electrical transmission lines **(page 144 equation 4)**. The parameters used in this equation include the current and voltage and the output port.

Regarding claim 3:

Elfadel discloses the system as set forth in claim 2, wherein the electrical behavior is one or more of the following: voltage and current waveforms at the near end and far end of each of the transmission lines **(page 144: equations 3-4 and accompanying explanations)**.

Regarding claim 4:

Elfadel discloses the system as set forth in claim 1, wherein the electrical characteristics include one or more of the following: per-unit-length resistance, per-unit-length inductance, per-unit-length capacitance, and per-unit-length conductance **(page 151: table III)**.

Regarding claim 5:

Elfadel discloses the system as set forth in claim 4, wherein the one or more of the electrical characteristics is dependent on operating frequency **(page 144: equation 2 and accompanying explanation)**.

Regarding claim 6:

Elfadel discloses the system as set forth in claim 1, wherein the physical characteristics include the transmission line length **(page 144 left column paragraph 2)**.

Regarding claim 7:

Elfadel discloses the system as set forth in claim 1, wherein the input further receives a maximum operating frequency **(page 146 left column paragraph 1)** of the electrical transmission line. A skilled artisan would have knowingly set an error threshold because in order to reduce the noise between the interconnections **(Applicant's 'Background of the Invention' page 1)**, the acceptable values would have to be input into the system.

Regarding claim 8:

Elfadel discloses the system as set forth in claim 1, wherein one or more of the electrical transmission lines are a multiconductor transmission line **(page 144 left column paragraph 2)**.

Regarding claim 9:

The combination of **Elfadel and Roychowdhury** is directed to the system as set forth in claim 1, wherein the total distortion is determined from maximum operating frequency of the electrical transmission line, length of the transmission line, and one or more of the electrical characteristics **(Roychowdhury: page 15 right hand column)**. In order to generate a macromodel with the lowest acceptable error rate, a skilled artisan would have knowingly compared the computed distortion and the preset range of acceptable error threshold values.

Regarding claim 10:

Elfadel discloses the system as set forth in claim 1, where the automatic selection process selects the macromodel by comparing the length of the electrical transmission line **(page 144 paragraph 2)** to a critical length **(page 145 right hand column paragraphs 2-3)** determined from an error threshold, maximum operating frequency of the electrical transmission line input **(page 146 left hand column paragraph 1)**, and one or more of the electrical characteristics **(page 144 equations 2-3)**.

Regarding claim 11:

Elfadel discloses the system as set forth in claim 1, wherein the macromodel is selected from one of a delay extraction macromodel **(page 147 'Pure Delay Extraction')** and a rational assumption macromodel **(page 147 'Rational Function Approximation')**.

Regarding claim 12:

Elfadel discloses the system as set forth in claim 1, wherein the computer system comprises a computer-aided-design (CAD) system **(page 149 'Integration with SPICE-like Simulator')**.

Regarding claim 13:

Elfadel discloses a signal bearing medium tangibly embodying a program of machine-readable instructions executable by a digital processing apparatus to perform operations to automatically select a macromodel from a set of macromodels for use in simulating a transmission line **(abstract)**, the operations comprising: providing input parameters of per-unit-length resistance, capacitance **(page 151 table III)**, per-unit-length inductance **(page 144 equation 2)**, per-unit-length **(page 144 left column paragraph 2)**, per-unit-length conductance **(page 144 equation 2)**, length **(page 144 left column paragraph 2)**, and maximum operating frequency **(page 146 left column paragraph 1)**.

Elfadel fails to explicitly disclose computing total distortion from the input parameters. **Roychowdhury teaches** an automatic macromodel generation program that computes the distortion of the electrical system **(Roychowdhury: page 15 right hand column).** At the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the teachings of Elfadel and Roychowdhury because accounting for distortion expands the scope of applicability of nonlinear macromodelling to encompass blocks in which strong and weak nonlinearities provide both an important and functional role **(Roychowdhury: page 15 right hand column).**

A skilled artisan would have knowingly set an error threshold because in order to reduce the noise between the interconnections **(Applicant's 'Background of the Invention' page 1)**, the acceptable values would have to be input into the system. In order to generate a macromodel with the lowest acceptable error rate, a skilled artisan would have knowingly compared the computed distortion and the preset range of acceptable error threshold values.

Regarding claim 15:

Elfadel discloses the signal bearing medium as set forth in claim 13, wherein the macromodel is selected from one of a delay extraction macromodel **(page 147 'Pure Delay Extraction')** and a rational assumption macromodel **(page 147 'Rational Function Approximation')**

Regarding claim 16:

Elfadel discloses the signal bearing medium according to claim 13 used in a computer-aided-design (CAD) system **(page 149 'Integration with SPICE-like Simulator').**

Regarding claim 17:

Elfadel discloses a signal-bearing medium tangibly embodying a program of machine-readable instructions executable by a digital processing apparatus to perform operations to automatically select a macromodel from a set of macromodels for use in simulating a transmission line **(abstract)**, the operations comprising:

a. providing input parameters of per-unit-length resistance, capacitance **(page 151 table III)**, per-unit-length inductance **(page 144 equation 2)**, per-unit-length **(page 144 left column paragraph 2)**, per-unit-length conductance **(page 144 equation 2)**, length **(page 144 left column paragraph 2)**, and maximum operating frequency **(page 146 left column paragraph 1)**

b. computing a critical length from the input parameters and comparing the length of the transmission line with the critical length to generate a macromodel**(page 145 right hand column)**.

Elfadel fails to explicitly disclose automatically selecting a macromodel. Roychowdhury teaches an automated macromodel generation system for electronic systems.**(Roychowdhury: abstract)**. At the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the teachings of Elfadel and Roychowdhury because automating the macromodelling process is essential for realistic exploration of the design space in current and future mixed signal SoCs/SiPs **(Roychowdhury: Introduction)**.

Regarding claim 19:

Elfadel discloses the signal bearing medium as set forth in claim 17, wherein the macromodel is selected from one of a delay extraction macromodel **(page 147 'Pure Delay Extraction')** and a rational assumption macromodel **(page 147 'Rational Function Approximation')**.

Regarding claim 20:

Elfadel discloses the signal bearing medium according to claim 17 used in a computer-aided-design (CAD) system **(page 149 'Integration with SPICE-like Simulator')**..

Allowable Subject Matter

6. **Claims 14 and 18 are objected to as being dependent upon a rejected base claim, but would be allowable** if rewritten in independent form including all of the limitations of the base claim and any intervening claims and all 101 and 112 rejections.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shambhavi Patel whose telephone number is (571) 272-5877. The examiner can normally be reached on Monday-Friday, 8:00 am – 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah can be reached on (571) 272-2279. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Shambhavi Patel
Examiner
Art Unit 2128

KAMINI SHAH
SUPERVISORY PATENT EXAMINER